

Dental care provided to sickle cell anemia patients stratified by age: A population-based study in Northeastern Brazil

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ABSTRACT

Objective: To assess differences in the dental care provided to sickle cell anemia (SCA) patients depending on age. This retrospective study used secondary data from the dental records of the Center of Hematology and Hemotherapy in Maranhão (HEMOMAR). **Materials and Methods:** Data were obtained from 574 dental records of patients with SCA treated or under treatment in the Dental Department of HEMOMAR from 2000 to 2011. Data on the gender, age, duration of dental treatment, number of patients submitted to periodontal treatment (PT), number of filled teeth (FT), teeth extracted (EX), endodontically treated teeth (ET), and reason for the dental procedures were collected. The Kruskal–Wallis test together with Dunn’s *post hoc* test, Chi-square test, and Spearman’s correlation was used for statistical analysis. An alpha error of 5% was considered acceptable. **Results:** Significant differences were found for FT, EX ($P < 0.05$), ET and PT ($P < 0.001$) between the age groups. There were fewer FT in children compared to other age groups ($P < 0.001$). The most common reasons for restorations and endodontic treatment were dental caries (100%) and irreversible pulpitis (55.6%), respectively. The main reasons for teeth extractions were residual roots (21.3%), chronic apical periodontitis (19.7%), and crown destruction (19.3%). There were positive correlations between age and EX ($r = 0.93$; $P = 0.025$) and ET ($r = 0.92$; $P = 0.028$). **Conclusions:** FT, ET, EX, and PT procedures become more common in older patients. Tooth decay is the main reason for dental treatment in SCA patients.

Key words: Dental care, health profile, sickle cell anemia

INTRODUCTION

Sickle cell anemia (SCA) is an inherited disease in individuals homozygous for hemoglobin S.^[1,2] Previous studies have shown clinical alterations in the oral mucosa and dental mineralized tissues and delayed tooth eruption,^[3] a high prevalence of dental caries,^[4] poor occlusion,^[5] and pulpal necrosis in healthy teeth^[6] in patients with SCA. However, some

studies have reported conflicting results as to the prevalence of caries and periodontal diseases.^[7,8] Thus, this study was conducted to assess differences in the dental care provided to individuals with SCA depending on age using quantitative analysis of the procedures performed in the Center of Hematology and Hemotherapy in Maranhão (HEMOMAR).

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MATERIALS AND METHODS

This retrospective study used secondary data obtained from 574 dental records of patients with SCA treated or under treatment in the Dental Department of HEMOMAR from 2000 to 2011. The local Ethics Research Committee approved the study under protocol #0067182011-73.

A single calibrated examiner performed data collection ($\kappa = 0.91$). Data on gender (male and female), age, duration of dental treatment (<1 year; >1-4 years; >4-7 years; >7-11 years), types of dental procedures, and reasons for dental procedures were collected. The patients were stratified in respect to age as children (0-9 years), adolescents (10-19 years), young adults (20-40 years), adults (41-65 years), and the elderly (over 65 years).^[9] Types of dental treatment included periodontal treatment (PT - yes or no), number of filled teeth (FT), number of extracted teeth (EX), and number of endodontically treated teeth (ET). The reasons for dental procedures included restorative treatment (caries), tooth extraction (periodontal disease, irreversible pulpitis, chronic apical periodontitis, crown destruction [more than 2/3 of the crown destroyed], failure of endodontic treatment, residual root, impacted teeth and not reported) and endodontic treatment (irreversible pulpitis, pulp necrosis, and chronic apical periodontitis).

All statistical analyses were performed using the SPSS software version 11 (IBM, NY, USA). The normality of the sample was tested using the Shapiro-Wilk test. The Kruskal-Wallis and Dunn's *post hoc* tests were performed to compare the FT, EX, and ET between age groups. The Chi-square test complemented by analysis of adjusted residuals was used to assess whether there were differences in the prevalence of PT between age groups. The Spearman's correlation was used to determine the correlation between age group and FT, EX, and ET. The level of significance was set for an alpha error of 5%.

RESULTS

Table 1 shows that the study population comprised predominantly of young adults (41.5%), males (53.8%), and patients under treatment for <1 year (51.2%).

Overall, 673 (100%) dental procedures were performed: 394 FT (58.6%), 241 EX (35.8%), and 38 ET (5.6%). Of

the dental records analyzed, 66 (11.5%) of 574 patients were submitted to PT [Table 2].

The most common reasons for restorations and endodontic treatment were dental caries (100%) and irreversible pulpitis (55.6%), respectively. The main reasons for teeth extractions were residual roots (21.3%), chronic apical periodontitis (19.7%), and crown destruction (19.3%) [Table 3].

The variables FT, EX, and ET had an asymmetric distribution between age groups. Differences in the frequencies of FT, EX, ET, and PT according to age group are shown in Table 2. The median number of FT was significantly lower in children than in adults, young adults and adolescents ($P < 0.001$), and significantly higher in adults than in adolescents ($P = 0.028$). Children had a lower median number of EX than the young adults ($P = 0.013$) and adults ($P = 0.022$). The median numbers of ET in children and adolescents were lower than in young adults and adults ($P < 0.001$). There was a higher prevalence of PT in the older age groups ($P < 0.001$).

Strong positive correlations were found between age group and EX ($r = 0.93$; $P = 0.025$) and ET ($r = 0.92$; $P = 0.028$), and a weak positive correlation between age group and FT ($r = 0.153$; $P < 0.001$).

DISCUSSION

Significant differences in the type of dental treatments were identified in the diverse age groups of patients with SCA [Table 3]. There was a growing trend of

Table 1: Study population stratified by age group, sex, and time of dental treatment

Variables	f	%
Age group		
Children	137	23.9
Adolescents	178	31.0
Young adults	238	41.5
Adults	21	3.6
Sex		
Male	309	53.8
Female	265	46.2
Time of dental treatment (years)		
<1	294	51.2
>1-4	124	21.6
>4-7	69	12.0
>7-11	87	15.2
Total	574	100.0

São Luis, Maranhão, Brazil (2000-2011). f. Absolute frequency, %: Relative frequency

Table 2: Differences between types of dental procedures and age group

	Age group								P ^a
	Children		Adolescents		Young adults		Adults		
	μ (SD)	m (dIQ)	μ (SD)	m (dIQ)	μ (SD)	m (dIQ)	μ (SD)	m (dIQ)	
Number of filled teeth	2.04 (3.14)	0 (3)	2.72 (2.39)	2 (3)	3.28 (3.32)	3 (5)	5.1 (4.7)	4 (4)	<0.05 ^{bode}
Number of extracted teeth	0.63 (1.08)	0 (1)	0.82 (1.41)	0 (1)	1.09 (1.73)	0 (2)	1.24 (1.73)	1 (2)	<0.05 ^{cd}
Number of endodontically treated teeth	0.02 (0.15)	0 (0)	0.06 (0.32)	0 (0)	0.13 (0.43)	0 (1)	0.38 (0.92)	0 (1)	<0.001 ^{cdeg}
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	P ^h
Periodontal treatment									
Yes	5	3.6	14	4.5	39*	16.4*	8*	38.1*	<0.001
No	132	96.4	164	95.5	199	83.6	13	61.9	
Total	137	100	178	100	238	100	21	100	

São Luis, Maranhão, Brazil (2000-2011). ^aKruskal-Wallis and Dunn's *post hoc* test, ^bAdolescent#children, ^cYoung adults#children, ^dAdults#children, ^eAdults#adolescents, ^fAdults#young adults, ^gYoung adults#adolescents, ^hChi-square test, *Local association. *f*: Absolute frequency, %: Relative frequency, μ: Mean, SD: Standard deviation, m: Median, dIQ: Interquartile deviation

Table 3: Reasons for dental procedures by age group

Reason	Age group								Total	
	Children		Adolescents		Young adults		Adults		<i>f</i>	%
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%		
Number of filled teeth										
Caries	69	50.4	133	74.7	175	73.5	17	81	394	100
Number of extracted teeth										
Periodontal disease	0	0	0	0	2	1.9	0	0	2	0.8
Irreversible pulpitis	0	0	1	1.5	1	0.9	0	0	2	0.8
CAP	14	29.2	13	18.8	16	14.8	4	28.6	47	19.7
Crown destruction	8	16.6	15	21.7	21	19.4	2	14.3	46	19.3
Failure of ET	0	0	0	0	2	1.9	0	0	2	0.8
Residual root	7	11.6	8	11.6	30	27.8	6	42.8	51	21.3
Impacted teeth	2	2.9	2	2.9	3	2.8	0	0	7	2.9
Not reported	17	43.5	30	43.5	30	30.5	2	14.3	82	34.4
ET										
Irreversible pulpitis	3	100	4	50	11	52.4	2	50	20	55.6
pulp necrosis	0	0	1	12.5	7	33.3	0	0	8	22.2
CAP	0	0	3	37.5	3	14.3	2	50	8	22.2

São Luis, Maranhão, Brazil (2000-2011). *f*: Absolute frequency, %: Relative frequency, CAP: Chronic apical periodontitis, ET: Endodontic treatment

curative dental procedures performed as patients aged such as FT, EX, ET, and PT. However till date, there are no studies correlating the type or frequency of dental procedures to age in this population. This cumulative trend of oral disease is also observed in the general Brazilian population, especially in respect to tooth decay. Based on the results of the National Oral Health Survey in 2010 (SB Brasil), in 35–44-year-old individuals, the mean decayed, missing, and FT index is 16.75, indicating a possible continuation of the severity of caries in the adult population.^[10] The absence of an oral health policy focused on this population may be responsible for the continuation of the high rates of dental caries. The lack of access to preventive measures and assistance or the inefficient and poor quality treatment possibly increase the complexity of the problem.^[11]

In Brazil, babies with SCA have been identified through the National Neonatal Screening Program, better known as the “heel prick test,” since 2001. We believe that dental care is neglected due to systemic complications of the disease. Probably this is the main cause of the increasing number of dental curative procedures with age seen in this study. Moreover, this is related to the difficulty of SCA patients in accessing primary healthcare services through the Brazilian National Health Service (NHS) because they have a genetic condition and are generally black.^[12-14] Genetic diseases do not have set guidelines in primary care. The focus of these patients is on secondary care, often in hematology centers.^[10] The black population in Brazil still live in a socially vulnerable situation with difficulties in accessing health services.^[13,14]

Since the effectiveness of dental care is one prerequisite in the planning of local oral healthcare services,^[15] we believe that the quantitative analysis of the types of dental procedures performed over an 11-year period in the HEMOMAR Dental Service might be an indirect measure to evaluate the oral health profile of this population.

There were relatively few adults in this population-based sample [Table 1]. According to Platt *et al.* (1994)^[16] and Alves (1996),^[17] health treatments are more commonly sought after by young individuals with SCA because these patients do not usually reach old age. These authors reported that patients with SCA die prematurely due to complications of the disease. According to Platt *et al.* (1994),^[16] a decrease of 25–30 years in life expectancy is observed in the survival curve of patients with SCA compared to the general population.

Restorative treatment was the most common type of conduct in this population. Previous studies found contrary results, that is, individuals with SCA presented with decay but they were not treated.^[8,18,19] According to these authors, this is a consequence of poor adherence to regular dental treatment due to lack of opportunity resulting from their numerous hospitalizations for disease-related complications throughout their lives.

Bacterial infections are considered the main cause of child mortality in this population.^[20] A plausible explanation for this is the fact that children with SCA are easily infected by bacteria.^[21] As a measure to prevent infant death, people with SCA are submitted to prolonged treatment with antibiotics such as penicillin since early childhood, which significantly reduces the number of *Streptococcus mutans* and *Aggregatibacter actinomycetemcomitans* in the oral cavity; this seems to reduce the number of caries and periodontal diseases.^[22] This may have contributed to the reduced number of curative dental procedures in children in this study.

Another relevant aspect is that only 11.5% of the sample was submitted to PT and of this total, a significant percentage was distributed across the age groups of young adults and adults ($P < 0.001$). This finding corroborates the results of Passos *et al.*,^[8] who after multivariate logistic regression analysis, showed that older individuals with SCA are at higher risk of developing periodontal pockets. These authors reported that age and oral hygiene habits are considered greater risk factors for the development of

periodontal diseases compared to the direct systemic impact of the disease.

A low number of FT, EX, and ET were observed in children and adolescents and a high number of EX and ET were seen in older age groups. These results demonstrate that the type of oral health care adopted at HEMOMAR is a curative hegemonic model. In Brazil, this dental care model was adopted for school-aged individuals in the late 1950s. In the present study, it was found that even making use of dental care services, young adults and adults with SCA had a high number of FT ($r = 0.153$; $P < 0.001$), EX ($r = 0.93$; $P = 0.025$), ET ($r = 0.92$; $P = 0.028$) and were also frequently submitted to PT ($P < 0.001$).^[23]

It is speculated that, in most of the cases, these procedures could have been avoided if the care model adopted by the institution had been based on prevention and promotion of health, which encourages training and oral health practices focused on conducts that have higher effectiveness and lower costs for the NHS than a curative model.^[24]

There are some public policies aimed at the population with SCA in Brazil. However, data from our study show that half of the population was under treatment for <1 year and most procedures were entirely curative. This confirms the vulnerability of these individuals to dental problems and consequently the need for assistance to treat problems. On the other hand, it is possible that dental care services do not prioritize prevention and promotion measures. In addition, individuals with SCA have psychological and social obstacles, which, added to the chronic nature of the disease, interfere in their search and access to treatment,^[23] possibly leading this population to the underuse of the oral health services offered by primary healthcare in the NHS.

The high frequency of teeth extractions (35.8%) in this study is explained by the clinical and radiographic diagnosis of chronic apical periodontitis as a sequela of pulp necrosis, possibly due to repeated vaso-occlusive crises that impair the microcirculation of the dental pulp [Table 3].^[6,25] It is believed that the fear that endodontic infections may evolve to osteomyelitis, and the impracticability of crown reconstruction through direct restorations, which are not offered by the Brazilian NHS, are the main reasons for tooth extraction.^[6,25]

Although the health service of this study has a good records system, information bias may be a limitation

in all research that uses secondary data. In the current study, it was not possible to establish any relationship between the underlying disease and dental conditions because there were no data in respect to sickle cell disease in the medical records on the past and current medical histories of patients, only the type of hemoglobinopathy.

Thus, due to the lack of publications on this topic, this study has much to contribute to the literature. In addition, as a population-based study, it allows a good generalization; or rather its data is representative of the population of patients with SCA treated in a public healthcare service. Furthermore, the probability of selection bias was reduced, as this research did not include SCA patients treated in the private sector.

CONCLUSIONS

Dental caries, endodontic, and PTs are more frequent with advancing age. The procedures offered are still mainly guided by curative strategies which indicate the need for systematic preventive treatment protocols for dental caries and their sequels and periodontal diseases in this population.

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Conflicts of interest

There are no conflicts of interest.

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